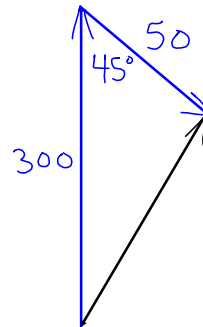
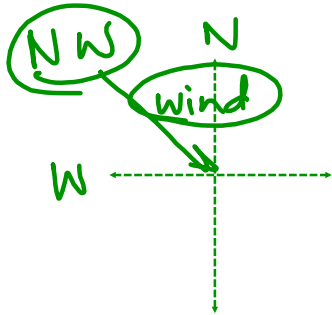


## Precalc Warm Up # 13-1

An airplane traveling 300 km/h in a north direction encounters a 50 km/h wind coming from North West. What is the actual speed of the plane (nearest 10th) and what is the direction (nearest 10th) it is now going in?



A **SCALAR** has magnitude (size) but no direction.

Ex: weight, length, ....

A **VECTOR** has both magnitude and direction.

Ex: force, velocity, acceleration, ...

We begin our last unit on vectors today, and it involves a little trig!

# EXERCISES 12.1

S V

The following situations need to be described using an appropriate measure. Classify the measure as a scalar (s) or a vector (v).

1. A classroom chair is moved from the front of the room to the back. V
2. The balance in a bank account. S
3. The electric current passing through an electric light tube. S V
4. A dog, out for a walk, is being restrained by a lead. V
5. An aircraft starts its takeoff run. V
6. The wind conditions before a yacht race. V
7. The amount of liquid in a jug. S
8. The length of a car. S

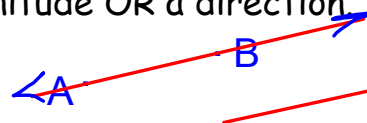
Segment  $\overline{AB}$  has a magnitude, but no direction.

Is  $\overline{AB}$  the same as  $\overline{BA}$  ?



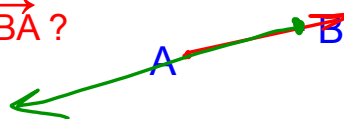
Line  $\overleftrightarrow{AB}$  doesn't have a magnitude OR a direction.

Is  $\overleftrightarrow{AB}$  the same as  $\overleftrightarrow{BA}$  ?

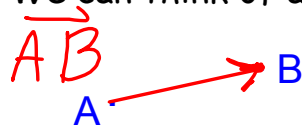


Ray  $\overrightarrow{AB}$  has a direction, but no magnitude.

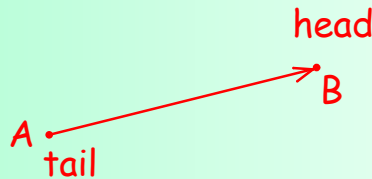
Is  $\overrightarrow{AB}$  the same as  $\overrightarrow{BA}$  ?



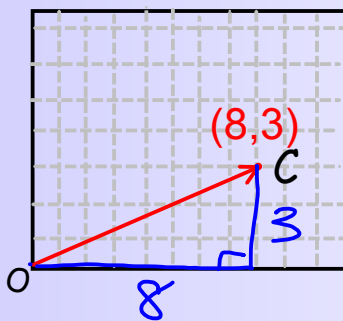
We can think of a vector as being a RAY that ends.



If a vector starts at  $A$  and ends at  $B$ , we use the notation  $\overrightarrow{AB}$ . Point  $A$  is called the "tail" of the vector and Point  $B$  is called the "head". We can refer to  $\overrightarrow{AB}$  as being a "position" vector from  $A$  to  $B$ .



If  $O$  is the origin, and  $C$  is  $(8,3)$ , then  $\overrightarrow{OC}$  is the position vector of  $C$



$$\overrightarrow{OC} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$$

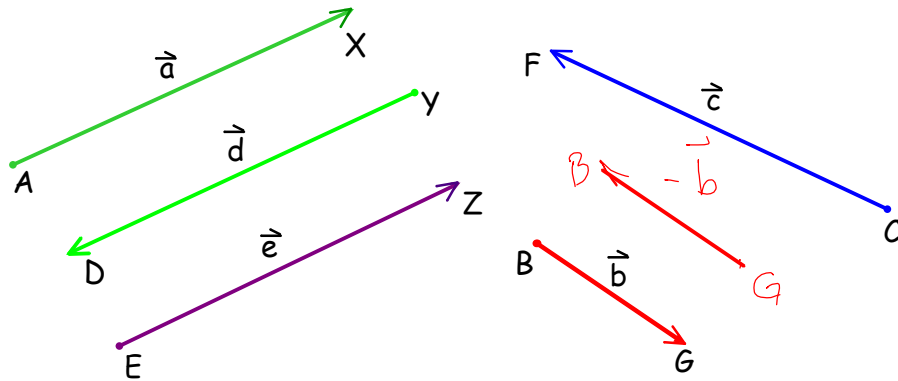
What is the magnitude of  $\overrightarrow{OC}$  ?

Notation for magnitude:

$$\sqrt{64+9}$$

$$|\overrightarrow{OC}| = \sqrt{73}$$

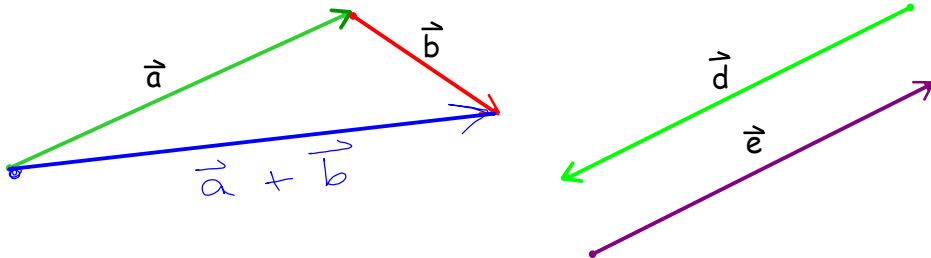
We can use a single letter to name a vector



Equal vectors must have same direction **AND** the same magnitude. Which vectors appear to be equal ?

Draw  $-\vec{b}$

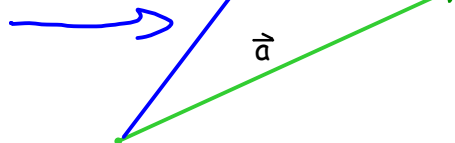
If  $\vec{b} = \overrightarrow{BG}$ , then  $-\vec{b} = \overrightarrow{GB}$



Add vectors  $\vec{a}$  and  $\vec{b}$

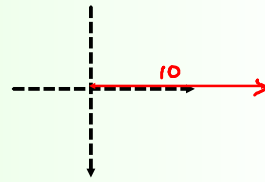
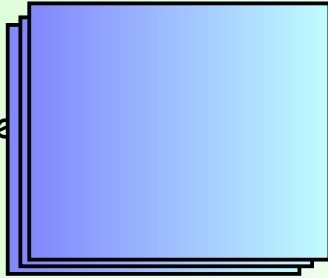
Add vectors  $\vec{d}$  and  $\vec{e} = \mathbf{0}$

Draw  $\vec{a} - \vec{b}$

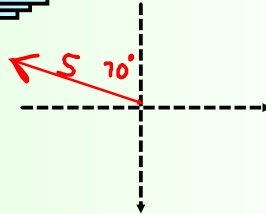


Sketch the following vectors:

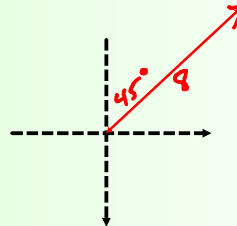
10 km in an Easter



5 miles per hour N 70°W



8 m NE



Express in terms of  $\vec{a}$  and  $\vec{b}$

a.  $\vec{CA}$

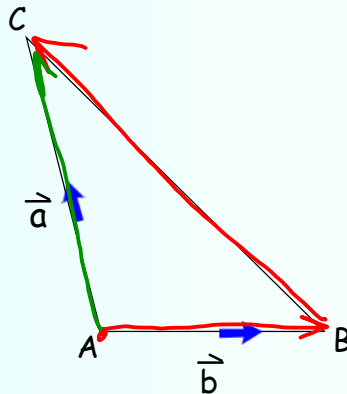
$$-\vec{a}$$

b.  $\vec{BC}$

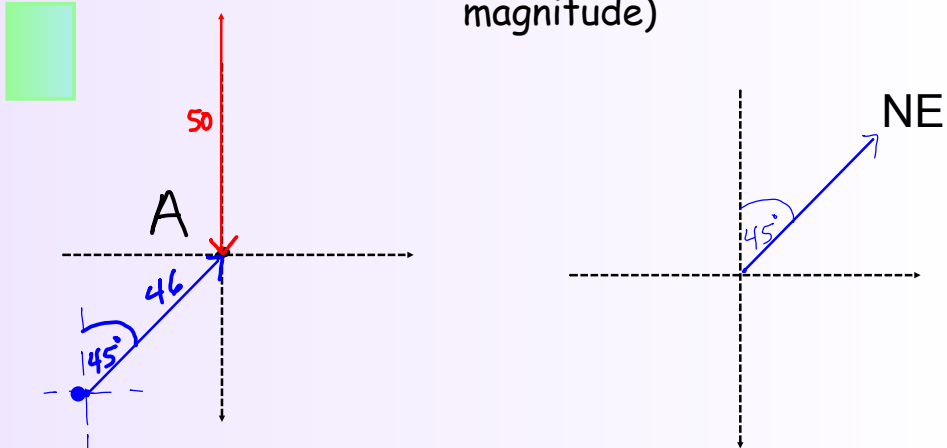
$$-\vec{b} + \vec{a}$$

c.  $|\vec{AB} + \vec{BC}|$

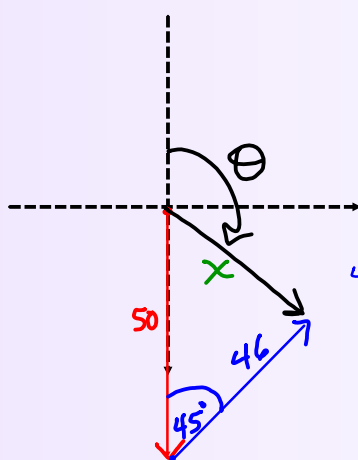
$$|\vec{a}|$$



2 forces, one of 50 Newtons acting in a Southerly direction and the other, 46 Newtons acting in a NE direction, are applied at a point A. What is the resulting force at A? (You need a direction AND a magnitude)



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$$x^2 = 50^2 + 46^2 - 2(50)(46)\cos 45^\circ$$

$$x \approx 36.9 \text{ so } \rightarrow x \text{ Newtons}$$

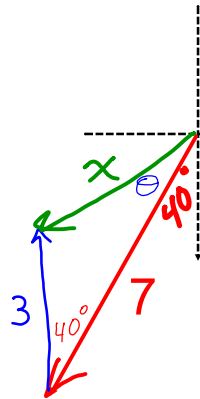
$$46 \left( \frac{\sin 45^\circ}{x} \right) = \frac{\sin \theta}{46}$$

$$\theta = 180 - \beta$$

$$\boxed{\approx 118.2^\circ \text{ T}}$$

Find the position of a person who walks

7 km S 40° W and then continues walking another 3 km in a Northerly direction. (You will need to find how far they are from their starting position, and bearing from the start.)



$$x^2 = 3^2 + 7^2 - 2(3)(7)\cos 40$$

$$x \approx 5.1 \text{ km} \rightarrow \text{STO} \rightarrow \text{A}$$

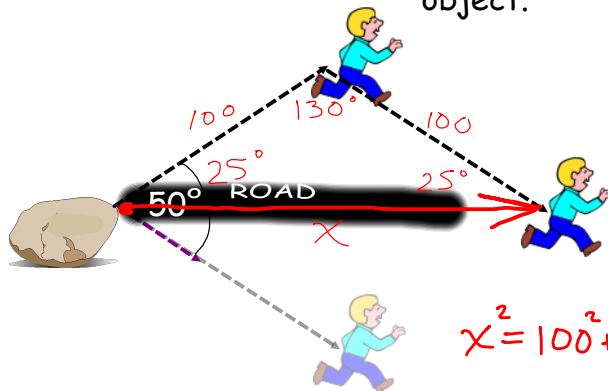
$$\frac{x \sin \theta}{3} = \frac{\sin 40}{7}$$

$$\theta \approx 22.3^\circ$$

$$\boxed{\text{S } 62.3^\circ \text{ W}}$$

Two men are pulling a large object up a road. They each have a 40 ft rope which is tied to the object and they each are pulling it with a force of 100 Newtons.

The angle between their ropes is  $50^\circ$ . Find the magnitude and direction of the force acting on the object.



$$x^2 = 100^2 + 100^2 - 2(100)(100)\cos 130^\circ$$

$$x \approx 181.3 \text{ newtons}$$

along the road

HW: p. 413 #2-10

The book writes  $\overrightarrow{AB}$  as **AB**

HW Quiz tomorrow.

p. 281

p. 304 evens